

Contents of *Aquaculture*, Volume 258

VOL. 258 NOS. 1–4

31 August 2006

## Review Article

- Detection of major penaeid shrimp viruses in Asia, a historical perspective with emphasis on Thailand  
T.W. Flegel (Pathumtani, Thailand) . . . . . 1

## Diseases

- The immune response of tiger shrimp *Penaeus monodon* and its susceptibility to *Photobacterium damsela* subsp. *damsela* under temperature stress  
F.-I. Wang and J.-C. Chen (Keelung, Taiwan, ROC) . . . . . 34
- The biopharmaceutics and oral bioavailability of two forms of oxytetracycline to the white shrimp, *Litopenaeus setiferus*  
L.A. Reed, T.C. Siewicki (Charleston, SC, United States) and J.C. Shah (Groton, CT, United States) . . . . . 42
- Expression, purification and characterization of WSSV-VP37 in *Pichia pastoris*  
L. Qing-hui, H. Jie, H. Wen-jun, L. Yan, L. Chun-ling and W. Qing-yin (Qingdao, People's Republic of China) . . . . . 55
- Candidatus Xenohaliotis californiensis* and *Haplosporidium montforti* associated with mortalities of abalone *Haliotis tuberculata* cultured in Europe  
P. Balseiro, R. Aranguren, C. Gestal, B. Novoa and A. Figueras (Pontevedra, Spain) . . . . . 63
- Infectious hypodermal and haematopoietic necrosis virus (IHHNV) infections in giant freshwater prawn, *Macrobrachium rosenbergii*  
C.Y. Hsieh, P.C. Chuang, L.C. Chen (Pingtung, Taiwan), Chien Tu (Taipei, Taiwan), M.S. Chien (Taichung, Taiwan), K.C. Huang, H.F. Kao (Executive Yuan, Taiwan), M.C. Tung and S.S. Tsai (Pingtung, Taiwan) . . . . . 73
- Microbial diversity within the water column of a larval rearing system for the ornate rock lobster (*Panulirus ornatus*)  
M.S. Payne (Townsville, St. Lucia, QLD, Australia), M.R. Hall, R. Bannister (Townsville, QLD, Australia), L. Sly (St. Lucia, QLD, Australia) and D.G. Bourne (Townsville, QLD, Australia) . . . . . 80
- High prevalence of dual and triple viral infections in black tiger shrimp ponds in India  
K.R. Umesha, B.K.M. Dass, B. Manja Naik, M.N. Venugopal, I. Karunasagar and I. Karunasagar (Mangalore, India) . . . . . 91
- Growth, survival and histological responses of the marine shrimp, *Litopenaeus vannamei*, to three dosage levels of oxytetracycline  
W.A. Bray (Port Aransas, TX, USA), R.R. Williams, D.V. Lightner (Tucson, AZ, USA) and A.L. Lawrence (Port Aransas, TX, USA) . . . . . 97
- Pathogenicity and colonization of *Litopenaeus vannamei* larvae by luminescent vibrios  
S.A. Soto-Rodríguez (Sinaloa, Mexico), N. Simoes (Yucatan, Mexico), A. Roque (Tarragona, España) and B. Gómez Gil (Sinaloa, Mexico) . . . . . 109
- Use of microalgae and bacteria to enhance protection of gnotobiotic *Artemia* against different pathogens  
A. Marques, T.H. Thanh, P. Sorgeloos and P. Bossier (Gent, Belgium) . . . . . 116
- A standardized method to propagate *Cryptocaryon irritans* on a susceptible host pompano *Trachinotus ovatus*  
X.M. Dan, A.X. Li, X.T. Lin, N. Teng and X.Q. Zhu (Guangzhou, PR China) . . . . . 127
- Multiplex RT-PCR detection and sequence comparison of viruses *MrNV* and *XSV* associated with white tail disease in *Macrobrachium rosenbergii*  
S. Tripathy, P.K. Sahoo, J. Kumari, B.K. Mishra, N. Sarangi (Bhubaneswar, India) and S. Ayyappan (New Delhi, India) . . . . . 134

Experimental transmission and virulence of a megalocytivirus (Family <i>Iridoviridae</i> ) of dwarf gourami ( <i>Colisa lalia</i> ) from Asia in Murray cod ( <i>Maccullochella peelii peelii</i> ) in Australia J. Go and R. Whittington (Sydney, NSW, Australia) . . . . .	140
Effect of nitrite on the immune response of freshwater prawn <i>Macrobrachium malcolmsonii</i> and its susceptibility to <i>Aeromonas hydrophila</i> R.K. Chand and P.K. Sahoo (Bhubaneswar, India). . . . .	150
Immunostimulant effects of dietary <i>Spirulina platensis</i> on carp, <i>Cyprinus carpio</i> H. Watanuki, K. Ota, A.C.M.A.R. Tassakka (Miyazaki, Japan), T. Kato (Chiba, Japan) and M. Sakai (Miyazaki, Japan) . . . . .	157
Vertebrae fusion in Atlantic salmon ( <i>Salmo salar</i> ): Development, aggravation and pathways of containment P.E. Witten (Sunndalsøra, Norway; Halifax, NS, Canada), A. Obach (Stavanger, Norway), A. Huysseune (Ghent, Belgium) and G. Baeverfjord (Sunndalsøra, Norway). . . . .	164
A method to diagnose the carrier state of <i>Vibrio vulnificus</i> serovar E in eels: Development and field studies E. Valiente and C. Amaro (Valencia, Spain) . . . . .	173
Rapid detection and identification of <i>Streptococcus iniae</i> using a monoclonal antibody-based indirect fluorescent antibody technique P. Klesius (Auburn, AL, United States), J. Evans (Chester town, MD, USA), C. Shoemaker, H. Yeh (Auburn, AL, United States), A.E. Goodwin (Pine Bluff, AR, USA), A. Adams and K. Thompson (Scotland, United Kingdom) . . . . .	180
An assessment of the risk of spreading the fish parasite <i>Gyrodactylus salaris</i> to uninfected territories in the European Union with the movement of live Atlantic salmon ( <i>Salmo salar</i> ) from coastal waters E. Peeler, M. Thrush (Weymouth, UK), L. Paisley (Søborg, Denmark) and C. Rodgers (Tarragona, Spain). . . . .	187
<b>Genetics</b>	
QTL detection of production traits for the Kuruma prawn <i>Penaeus japonicus</i> (Bate) using AFLP markers Y. Li, L. Dierens, K. Byrne, E. Miggiano, S. Lehnert (Sta. Lucia, Queensland, Australia), N. Preston (Cleveland, Queensland, Australia) and R. Lyons (Sta. Lucia, Queensland, Australia) . . . . .	198
A method for the comparison of chromaticity parameters in fish skin: Preliminary results for coloration pattern of red skin Sparidae M. Pavlidis, N. Papandroulakis and P. Divanach (Crete, Greece). . . . .	211
Genetic variation in wild and cultured populations of the pearl oyster <i>Pinctada fucata</i> from southern China D.H. Yu (Guangdong, China; Hong Kong, China) and K.H. Chu (Hong Kong, China) . . . . .	220
Genetic diversity of common carp in Vietnam using direct sequencing and SSCP analysis of the mitochondrial DNA control region B.T. Thai (Warrnambool, VIC, Australia; Bac Ninh, Vietnam), T.A. Pham (Bac Ninh, Vietnam) and C.M. Austin (Warrnambool, VIC, Australia) . . . . .	228
Number of contributing subpopulations and mating design in the base population when establishing a selective breeding program for fish M. Holtmark, A.K. Sonesson, B. Gjerde and G. Klemetsdal (Ås, Norway) . . . . .	241
Genetic analysis of the gametophytes of <i>Undaria pinnatifida</i> (Phaeophyceae) with ISSR method X. Wang, D. Wang, D. Li and D. Duan (Qingdao, PR China). . . . .	250
Genetic characterization of wild common carp ( <i>Cyprinus carpio</i> L.) from Turkey D. Memiş (Istanbul, Turkey) and K. Kohlmann (Berlin, Germany). . . . .	257
Resistance to vibriosis in Atlantic cod ( <i>Gadus morhua</i> L.): First challenge test results A. Kettunen and K.T. Fjalestad (Tromsø, Norway). . . . .	263
Effect of rearing temperatures on the sex ratios of <i>Oreochromis niloticus</i> populations M. Tessema, A. Müller-Belecke and G. Hörstgen-Schwark (Göttingen, Germany) . . . . .	270
The effects of selective breeding on the genetic structure of shrimp <i>Fenneropenaeus chinensis</i> populations Z. Li, J. Li, Q. Wang, Y. He and P. Liu (Qingdao, PR China). . . . .	278
Parentage determination of Chinese shrimp ( <i>Fenneropenaeus chinensis</i> ) based on microsatellite DNA markers S. Dong, J. Kong, T. Zhang, X. Meng and R. Wang (Qingdao, China). . . . .	283
<b>Husbandry and Management</b>	
Nutrient mass balances in semi-intensive shrimp ponds from Sonora, Mexico using two feeding strategies: Trays and mechanical dispersal R. Casillas-Hernández (Sonora, México), F. Magallón-Barajas, G. Portillo-Clarck (La Paz, B.C.S., México) and F. Pérez-Osuna (Sinaloa, Mexico) . . . . .	289
A fully integrated GIS-based model of particulate waste distribution from marine fish-cage sites R.A. Corner, A.J. Brooker, T.C. Telfer and L.G. Ross (Scotland, United Kingdom) . . . . .	299
Induction of gynogenesis in endangered sarapunti, <i>Puntius sarana</i> (Hamilton) and evidence for female homogamety B.K. Chakraborty (Bangladesh), M.I. Miah, M.J.A. Mirja and M.A.B. Habib (Mymensing, Bangladesh) . . . . .	312

Polyculture of Pacific white shrimp, <i>Litopenaeus vannamei</i> , giant oyster, <i>Crassostrea gigas</i> and black clam, <i>Chione fluctifraga</i> in ponds in Sonora, Mexico L.R. Martinez-Cordova and M. Martinez-Porchas (Sonora, México) . . . . .	321
Settling abalone veliger larvae in a free-swimming microalgal culture S.J. Pang, Z.H. Zhang, Y. Bao and S.Q. Gao (Qingdao, PR China) . . . . .	327
Necrotizing hepatopancreatitis (NHP) infected <i>Penaeus vannamei</i> female broodstock: Effect on reproductive parameters, nauplii and larvae quality L.F. Aranguren, B. Briñez, L. Aragón, C. Platz, X. Caraballo, A. Suarez and M. Salazar (Bogotá, Colombia) . . . . .	337
Effect of stocking density on growth, settlement and survival of clam larvae, <i>Meretrix meretrix</i> B. Liu, B. Dong, B. Tang, T. Zhang and J. Xiang (Qingdao, China) . . . . .	344
Effect of photoperiod manipulation on the growth performance and stress response of juvenile red sea bream ( <i>Pagrus major</i> ) A.K. Biswas, M. Seoka (Wakayama, Japan), Y. Tanaka (Osaka, Japan), K. Takii and H. Kumai (Wakayama, Japan) . . . . .	350
Rice protein concentrate meal as a potential ingredient in practical diets for rainbow trout ( <i>Oncorhynchus mykiss</i> ) G.B. Palmegiano, F. Daprà, G. Forneris, F. Gai, L. Gasco, K. Guo, P.G. Peiretti, B. Sicuro and I. Zoccarato (Grugliasco (TO), Italy) . . . . .	357
Feeding and development of Senegal sole ( <i>Solea senegalensis</i> ) larvae reared in different photoperiods J. Pedro Cañavate, R. Zerolo and C. Fernández-Díaz (Cádiz, Spain) . . . . .	368
Feeding of early larval pike <i>Esox lucius</i> L. reared in illuminated cages V. Žiliukienė and V. Žiliukas (Lithuania) . . . . .	378
Sparing effect of pond water on vitamins in shrimp diets S.M. Moss, I.P. Forster (Waimanalo, Hawaii, USA) and A.G.J. Tacon (Kaneohe, Hawaii, USA) . . . . .	388
Effect of natural production in a zero exchange suspended microbial floc based super-intensive culture system for white shrimp <i>Litopenaeus vannamei</i> W. Wasielesky Jr. (Rio Grande (RS), Brazil), H. Atwood, A. Stokes and C.L. Browdy (Bluffton, South Carolina, USA) . . . . .	396
The influence of animal density and water turbulence on growth and survival of cultured spiny lobster ( <i>Jasus edwardsii</i> ) larvae G.G. Smith and A.J. Ritar (Taroona, Tasmania, Australia) . . . . .	404
Cage polyculture of the Pacific white shrimp <i>Litopenaeus vannamei</i> and the Philippines seaweed <i>Kappaphycus alvarezii</i> J.V. Lombardi, H.L. de Almeida Marques, R.T.L. Pereira, O.J.S. Barreto and E.J. de Paula (São Paulo, Brazil) . . . . .	412
Enhancement of larval settlement and metamorphosis through biological and chemical cues in the abalone <i>Haliotis diversicolor supertexta</i> H. Li, Wei Lin (Shenzhen, Dalian, PR China), G. Zhang, Z. Cai, G. Cai (Shenzhen, PR China), Y. Chang (Dalian, PR China) and K. Xing (Tianjin, PR China) . . . . .	416
Spat collection, growth and meat yield of <i>Pinna bicolor</i> (Gmelin) in suspended culture in northern Australia A.C. Beer and P.C. Southgate (Townsville, QLD, Australia) . . . . .	424
Growth improvement by probiotic in European sea bass juveniles ( <i>Dicentrarchus labrax</i> , L.), with particular attention to IGF-1, myostatin and cortisol gene expression O. Carnevali, L. de Vivo, R. Sulpizio, G. Gioacchini, I. Olivotto (Ancona, Italy), S. Silvi and A. Cresci (Italy) . . . . .	430
Effects of the filter feeder silver carp and the bottom feeders mrigal and common carp on small indigenous fish species (SIS) and pond ecology A. Milstein (Israel), A.F. Ahmed, O.A. Masud, A. Kadir and M.A. Wahab (Mymensingh, Bangladesh) . . . . .	439
A new three-phase culture method for Manila clam, <i>Ruditapes philippinarum</i> , farming in northern China G. Zhang (Qingdao, PR China) and X. Yan (Qingdao, Beijing, Dalian, PR China) . . . . .	452
Effect of slaughter methods on blood spotting and residual blood in fillets of Atlantic salmon ( <i>Salmo salar</i> ) S.H. Olsen, N.K. Sorensen, S.K. Stormo and E.O. Elvevoll (Tromsø, Norway) . . . . .	462

## Nutrition

Cross effects of the strain of dietary <i>Saccharomyces cerevisiae</i> and rearing conditions on the onset of intestinal microbiota and digestive enzymes in rainbow trout, <i>Oncorhynchus mykiss</i> , fry Y. Waché, F. Auffray, F.-J. Gatesoupe, J. Zambonino (Plouzané, France), V. Gayet, L. Labbé (Sizun, France) and C. Quentel (Plouzané, France) . . . . .	470
Effect of the incorporation level of herring meal into test diet on apparent digestibility coefficients for protein and energy by juvenile haddock, <i>Melanogrammus aeglefinus</i> L. J.-D. Kim (Chuncheon, Korea), S.M. Tibbetts, J.E. Milley and S.P. Lall (Nova Scotia Canada) . . . . .	479
Comparison of red chilli ( <i>Capsicum annuum</i> ) oleoresin and astaxanthin on rainbow trout ( <i>Oncorhynchus mykiss</i> ) fillet pigmentation G. Ingle de la Mora (C.P., México), J.L. Arredondo-Figueroa (Iztapalapa, México), J.T. Ponce-Palafox (Morelos, México), I.d.A. Barriga-Soca and J.E. Vernon-Carter (Iztapalapa, México) . . . . .	487



Feeding Saithe fillet or a formulated moist feed to the Brown crab <i>Cancer pagurus</i> : Effects on yield, composition and sensory quality of medium filled captured crabs G.M. Berge (Ås, Norway) and A. Woll (Ålesund, Norway) . . . . .	496
Effects of replacing fish meal with soy protein concentrate on feed intake and growth of juvenile Japanese flounder, <i>Paralichthys olivaceus</i> J. Deng, K. Mai, Q. Ai, W. Zhang, X. Wang, W. Xu and Z. Liufu (Qingdao, PR China) . . . . .	503
Effects of photoperiod and feeding frequency on performance of newly weaned Australian snapper <i>Pagrus auratus</i> B.J. Tucker (Sydney, Australia), M.A. Booth, G.L. Allan (Taylors Beach, NSW, Australia), D. Booth (Sydney, Australia) and D.S. Fielder (Taylors Beach, NSW, Australia) . . . . .	514
Effect of choline and methionine as methyl group donors on juvenile kuruma shrimp, <i>Marsupenaeus japonicus</i> Bate F.R. Michael (Kagoshima, Japan; Alexandria, Egypt), S. Koshio, S.-i. Teshima, M. Ishikawa and O. Uyan (Kagoshima, Japan) . . .	521
Induction of population growth, mictic female production and body size by treatment of a synthetic GnRH analogue in the freshwater rotifer, <i>Brachionus calyciflorus</i> Pallas V. Sugumar and N. Munuswamy (Chennai, India) . . . . .	529
Dietary lysine requirement of juvenile Japanese seabass, <i>Lateolabrax japonicus</i> K. Mai, Lu Zhang, Q. Ai, Q. Duan, C. Zhang, H. Li, J. Wan and Z. Liufu (Qingdao, PR China) . . . . .	535
Effects of seawater potassium concentration on the dietary potassium requirement of <i>Litopenaeus vannamei</i> C.-B. Zhu (Qingdao, Guangzhou, China), S.-L. Dong, F. Wang (Qingdao, China) and H.-H. Zhang (Guangzhou, China) . . . . .	543
Optimal dietary methionine requirement for Juvenile Cobia ( <i>Rachycentron canadum</i> ) Q.-C. Zhou, Z.-H. Wu (Zhanjiang, People's Republic of China), B.-P. Tan (Qingdao, People's Republic of China), S.-Y. Chi and Q.-H. Yang (Zhanjiang, People's Republic of China) . . . . .	551
Lutein does not influence flesh astaxanthin pigmentation in the Atlantic salmon ( <i>Salmo salar</i> L.) R.E. Olsen (Matredal, Norway) and R.T.M. Baker (Limburgerhof, Germany) . . . . .	558
<b>Physiology and Endocrinology</b>	
Whole-body cortisol is an indicator of crowding stress in adult zebrafish, <i>Danio rerio</i> J.M. Ramsay, G.W. Feist (Corvallis, OR, USA), Z.M. Varga, M. Westerfield (Eugene, OR, USA), M.L. Kent and C.B. Schreck (Corvallis, OR, USA) . . . . .	565
Effect of salinity on reproduction and survival of the copepod <i>Pseudodiaptomus annandalei</i> Sewell, 1919 Q. Chen, J. Sheng, Q. Lin, Y. Gao and J. Lv (Guangzhou, People's Republic of China) . . . . .	575
Physiological effects of crowding in rainbow trout, <i>Oncorhynchus mykiss</i> , selected for low and high stress responsiveness C.E. Trenzado, A.E. Morales and M. de la Higuera (Granada, Spain) . . . . .	583
Comparison of growth, osmoregulatory capacity, ionic regulation and organosomatic indices of black tiger prawn ( <i>Penaeus monodon</i> Fabricius, 1798) juveniles reared in potassium fortified inland saline water and ocean water at different salinities U. Tantulo and R. Fotadar (Bentley, Western Australia, Australia) . . . . .	594
Thermal tolerance and metabolic activity of yellowtail catfish <i>Pangasius pangasius</i> (Hamilton) advanced fingerlings with emphasis on their culture potential D. Debnath, A.K. Pal, N.P. Sahu, K. Baruah, S. Yengkokpam, T. Das and S.M. Manush (Mumbai, India) . . . . .	606
Pharmacological and immunocytochemical investigation of the role of catecholamines on larval metamorphosis by $\beta$ -adrenergic-like receptor in the bivalve <i>Meretrix meretrix</i> G. Wang (Qingdao, Beijing, PR China), B. Liu (Qingdao, PR China), B. Tang (Qingdao, Beijing, PR China), T. Zhang and J. Xiang (Qingdao, PR China) . . . . .	611
Seasonal variations in chemical, physical, textural, and microstructural properties of adductor muscles of Pacific lions-paw scallop ( <i>Nodipecten subnodosus</i> ) A.I. Beltrán-Lugo, A.N. Maeda-Martínez (La Paz, Mexico), R. Pacheco-Aguilar (Sonora, México) and H.G. Nolasco-Soria (La Paz, Mexico) . . . . .	619
Metabolic and immune responses in Pacific whiteleg shrimp <i>Litopenaeus vannamei</i> exposed to a repeated handling stress L. Mercier, E. Palacios, Á.I. Campa-Córdova, D. Tovar-Ramírez, R. Hernández-Herrera and I.S. Racotta (Baja California Sur, México) . . . . .	633
<b>Technical Paper</b>	
Development of a multiplex PCR microsatellite assay in brown trout <i>Salmo trutta</i> , and its potential application for the genus E. Lerceteau-Köhler and S. Weiss (Graz, Austria) . . . . .	641

**Short Communications**

Survival and water balance of black sea bass held in a range of salinities and calcium-enhanced environments after abrupt salinity change S.P. Young (Clemson, South Carolina, United States), T.I.J. Smith (Charleston, South Carolina, United States) and J.R. Tomasso (San Marcos, Texas, United States) . . . . .	646
A simple device for sampling pond sediment T. Somsiri (Bangkok, Thailand), D.T.H. Oanh (Vietnam), S. Chinabut (Bangkok, Thailand), N.T. Phuong (Vietnam), M. Shariff, F.Md. Yusoff (Selangor, Malaysia), K. Bartie (Stirling, UK), M. Giacomini, M. Robba, S. Bertone (Genova, Italy), G. Huys (Gent, Belgium) and A. Teale (Stirling, UK) . . . . .	650
Effects of mussel farming on macrobenthic community structure in Southeastern Brazil K.G. da Costa and R.C. Nalesso (Vitória-ES, Brazil) . . . . .	655
Active substances from <i>Ceramium botryocarpum</i> used as antifouling products in aquaculture A. Bazes, A. Silkina, D. Defer (Lorient Cedex, France), C. Bernède-Bauduin (Paris, Cedex, France), E. Quémener (Lorient Cedex, France), J.-P. Braud (Bouin, France) and N. Bourgougnon (Lorient Cedex, France) . . . . .	664
Using hanging plastic trays for three-dimensional collection of antique mactra ( <i>Mactra antiquata</i> ) spat S. Chen, J. Wu, L. Chen and H. Zhang (Guangzhou, China) . . . . .	675
Protein sparing effect of carbohydrates in the diet of <i>Cirrhinus mrigala</i> (Hamilton, 1822) fry R.K. Singh, A.K. Balange and M.M. Ghughuskar (Mumbai, India) . . . . .	680
Extensive screening of sturgeon genomes by random screening techniques revealed no sex-specific marker S. Wuertz (Berlin, Germany), S. Gaillard (La Garde, France), F. Barbisan (Padova, Italy), S. Carle (La Seyne/Mer, France), L. Congiu (Padova, Italy), A. Forlani (Ferrara, Italy), J. Aubert (La Garde, France), F. Kirschbaum (Berlin, Germany), E. Tosi (Ferrara, Italy), L. Zane (Padova, Italy) and J.-P. Grillasca (La Garde, France) . . . . .	685
<b>Contents of Aquaculture, Volume 258.</b> . . . .	689

## Contents (continued)

High prevalence of dual and triple viral infections in black tiger shrimp ponds in India K.R. Umesh, B.K.M. Dass, B. Manja Naik, M.N. Venugopal, I. Karunasagar and I. Karunasagar (Mangalore, India) . . . . .	91
Growth, survival and histological responses of the marine shrimp, <i>Litopenaeus vannamei</i> , to three dosage levels of oxytetracycline W.A. Bray (Port Aransas, TX, USA), R.R. Williams, D.V. Lightner (Tucson, AZ, USA) and A.L. Lawrence (Port Aransas, TX, USA) . . . . .	97
Pathogenicity and colonization of <i>Litopenaeus vannamei</i> larvae by luminescent vibrios S.A. Soto-Rodríguez (Sinaloa, Mexico), N. Simoes (Yucatan, Mexico), A. Roque (Tarragona, España) and B. Gómez Gil (Sinaloa, Mexico) . . . . .	109
Use of microalgae and bacteria to enhance protection of gnotobiotic <i>Artemia</i> against different pathogens A. Marques, T.H. Thanh, P. Sorgeloos and P. Bossier (Gent, Belgium) . . . . .	116
A standardized method to propagate <i>Cryptocaryon irritans</i> on a susceptible host pompano <i>Trachinotus ovatus</i> X.M. Dan, A.X. Li, X.T. Lin, N. Teng and X.Q. Zhu (Guangzhou, PR China) . . . . .	127
Multiplex RT-PCR detection and sequence comparison of viruses <i>MrNV</i> and <i>XSV</i> associated with white tail disease in <i>Macrobrachium rosenbergii</i> S. Tripathy, P.K. Sahoo, J. Kumari, B.K. Mishra, N. Sarangi (Bhubaneswar, India) and S. Ayyappan (New Delhi, India) . . . . .	134
Experimental transmission and virulence of a megalocytivirus (Family <i>Iridoviridae</i> ) of dwarf gourami ( <i>Colisa lalia</i> ) from Asia in Murray cod ( <i>Maccullochella peelii peelii</i> ) in Australia J. Go and R. Whittington (Sydney, NSW, Australia) . . . . .	140
Effect of nitrite on the immune response of freshwater prawn <i>Macrobrachium malcolmsonii</i> and its susceptibility to <i>Aeromonas hydrophila</i> R.K. Chand and P.K. Sahoo (Bhubaneswar, India) . . . . .	150
Immunostimulant effects of dietary <i>Spirulina platensis</i> on carp, <i>Cyprinus carpio</i> H. Watanuki, K. Ota, A.C.M.A.R. Tassakka (Miyazaki, Japan), T. Kato (Chiba, Japan) and M. Sakai (Miyazaki, Japan) . . . . .	157
Vertebrae fusion in Atlantic salmon ( <i>Salmo salar</i> ): Development, aggravation and pathways of containment P.E. Witten (Sunndalsøra, Norway; Halifax, NS, Canada), A. Obach (Stavanger, Norway), A. Huysseune (Ghent, Belgium) and G. Baevefjord (Sunndalsøra, Norway) . . . . .	164
A method to diagnose the carrier state of <i>Vibrio vulnificus</i> serovar E in eels: Development and field studies E. Valiente and C. Amaro (Valencia, Spain) . . . . .	173
Rapid detection and identification of <i>Streptococcus iniae</i> using a monoclonal antibody-based indirect fluorescent antibody technique P. Klesius (Auburn, AL, United States), J. Evans (Chester town, MD, USA), C. Shoemaker, H. Yeh (Auburn, AL, United States), A.E. Goodwin (Pine Bluff, AR, USA), A. Adams and K. Thompson (Scotland, United Kingdom) . . . . .	180
An assessment of the risk of spreading the fish parasite <i>Gyrodactylus salaris</i> to uninfected territories in the European Union with the movement of live Atlantic salmon ( <i>Salmo salar</i> ) from coastal waters E. Peeler, M. Thrush (Weymouth, UK), L. Paisley (Søborg, Denmark) and C. Rodgers (Tarragona, Spain) . . . . .	187
<b>Genetics</b>	
QTL detection of production traits for the Kuruma prawn <i>Penaeus japonicus</i> (Bate) using AFLP markers Y. Li, L. Dierens, K. Byrne, E. Miggiano, S. Lehnert (Sta. Lucia, Queensland, Australia), N. Preston (Cleveland, Queensland, Australia) and R. Lyons (Sta. Lucia, Queensland, Australia) . . . . .	198
A method for the comparison of chromaticity parameters in fish skin: Preliminary results for coloration pattern of red skin Sparidae M. Pavlidis, N. Papandroulakis and P. Divanach (Crete, Greece) . . . . .	211
Genetic variation in wild and cultured populations of the pearl oyster <i>Pinctada fucata</i> from southern China D.H. Yu (Guangdong, China; Hong Kong, China) and K.H. Chu (Hong Kong, China) . . . . .	220
Genetic diversity of common carp in Vietnam using direct sequencing and SSCP analysis of the mitochondrial DNA control region B.T. Thai (Warrnambool, VIC, Australia; Bac Ninh, Vietnam), T.A. Pham (Bac Ninh, Vietnam) and C.M. Austin (Warrnambool, VIC, Australia) . . . . .	228
Number of contributing subpopulations and mating design in the base population when establishing a selective breeding program for fish M. Holtsmark, A.K. Sonesson, B. Gjerde and G. Klemetsdal (Ås, Norway) . . . . .	241
Genetic analysis of the gametophytes of <i>Undaria pinnatifida</i> (Phaeophyceae) with ISSR method X. Wang, D. Wang, D. Li and D. Duan (Qingdao, PR China) . . . . .	250



## Contents (continued)

Genetic characterization of wild common carp ( <i>Cyprinus carpio</i> L.) from Turkey D. Memiş (Istanbul, Turkey) and K. Kohlmann (Berlin, Germany) . . . . .	257
Resistance to vibriosis in Atlantic cod ( <i>Gadus morhua</i> L.): First challenge test results A. Kettunen and K.T. Fjalestad (Tromsø, Norway) . . . . .	263
Effect of rearing temperatures on the sex ratios of <i>Oreochromis niloticus</i> populations M. Tessema, A. Müller-Belecke and G. Hörstgen-Schwark (Göttingen, Germany) . . . . .	270
The effects of selective breeding on the genetic structure of shrimp <i>Fenneropenaeus chinensis</i> populations Z. Li, J. Li, Q. Wang, Y. He and P. Liu (Qingdao, PR China) . . . . .	278
Parentage determination of Chinese shrimp ( <i>Fenneropenaeus chinensis</i> ) based on microsatellite DNA markers S. Dong, J. Kong, T. Zhang, X. Meng and R. Wang (Qingdao, China) . . . . .	283
<b>Husbandry and Management</b>	
Nutrient mass balances in semi-intensive shrimp ponds from Sonora, Mexico using two feeding strategies: Trays and mechanical dispersal R. Casillas-Hernández (Sonora, México), F. Magallón-Barajas, G. Portillo-Clarck (La Paz, B.C.S., México) and F. Pérez-Osuna (Sinaloa, Mexico) . . . . .	289
A fully integrated GIS-based model of particulate waste distribution from marine fish-cage sites R.A. Corner, A.J. Brooker, T.C. Telfer and L.G. Ross (Scotland, United Kingdom) . . . . .	299
Induction of gynogenesis in endangered sarpunti, <i>Puntius sarana</i> (Hamilton) and evidence for female homogamety B.K. Chakraborty (Bangladesh), M.I. Miah, M.J.A. Mirja and M.A.B. Habib (Mymensing, Bangladesh) . . . . .	312
Polyculture of Pacific white shrimp, <i>Litopenaeus vannamei</i> , giant oyster, <i>Crassostrea gigas</i> and black clam, <i>Chione fluitifraga</i> in ponds in Sonora, Mexico L.R. Martinez-Cordova and M. Martinez-Porchas (Sonora, México) . . . . .	321
Settling abalone veliger larvae in a free-swimming microalgal culture S.J. Pang, Z.H. Zhang, Y. Bao and S.Q. Gao (Qingdao, PR China) . . . . .	327
Necrotizing hepatopancreatitis (NHP) infected <i>Penaeus vannamei</i> female broodstock: Effect on reproductive parameters, nauplii and larvae quality L.F. Aranguren, B. Briñez, L. Aragón, C. Platz, X. Caraballo, A. Suarez and M. Salazar (Bogotá, Colombia) . . . . .	337
Effect of stocking density on growth, settlement and survival of clam larvae, <i>Meretrix meretrix</i> B. Liu, B. Dong, B. Tang, T. Zhang and J. Xiang (Qingdao, China) . . . . .	344
Effect of photoperiod manipulation on the growth performance and stress response of juvenile red sea bream ( <i>Pagrus major</i> ) A.K. Biswas, M. Seoka (Wakayama, Japan), Y. Tanaka (Osaka, Japan), K. Takii and H. Kumai (Wakayama, Japan) . . . . .	350
Rice protein concentrate meal as a potential ingredient in practical diets for rainbow trout ( <i>Oncorhynchus mykiss</i> ) G.B. Palmegiano, F. Daprà, G. Forneris, F. Gai, L. Gasco, K. Guo, P.G. Peiretti, B. Sicuro and I. Zoccarato (Grugliasco (TO), Italy) . . . . .	357
Feeding and development of Senegal sole ( <i>Solea senegalensis</i> ) larvae reared in different photoperiods J. Pedro Cañavate, R. Zerolo and C. Fernández-Díaz (Cádiz, Spain) . . . . .	368
Feeding of early larval pike <i>Esox lucius</i> L. reared in illuminated cages V. Žiliukienė and V. Žiliukas (Lithuania) . . . . .	378
Sparing effect of pond water on vitamins in shrimp diets S.M. Moss, I.P. Forster (Waimanalo, Hawaii, USA) and A.G.J. Tacon (Kaneohe, Hawaii, USA) . . . . .	388
Effect of natural production in a zero exchange suspended microbial floc based super-intensive culture system for white shrimp <i>Litopenaeus vannamei</i> W. Wasielesky Jr. (Rio Grande (RS), Brazil), H. Atwood, A. Stokes and C.L. Browdy (Bluffton, South Carolina, USA) . . . . .	396
The influence of animal density and water turbulence on growth and survival of cultured spiny lobster ( <i>Jasus edwardsii</i> ) larvae G.G. Smith and A.J. Ritar (Taroona, Tasmania, Australia) . . . . .	404
Cage polyculture of the Pacific white shrimp <i>Litopenaeus vannamei</i> and the Philippines seaweed <i>Kappaphycus alvarezii</i> J.V. Lombardi, H.L. de Almeida Marques, R.T.L. Pereira, O.J.S. Barreto and E.J. de Paula (São Paulo, Brazil) . . . . .	412
Enhancement of larval settlement and metamorphosis through biological and chemical cues in the abalone <i>Haliotis diversicolor supertexta</i> H. Li, Wei Lin (Shenzhen, Dalian, PR China), G. Zhang, Z. Cai, G. Cai (Shenzhen, PR China), Y. Chang (Dalian, PR China) and K. Xing (Tianjin, PR China) . . . . .	416

## Contents (continued)

Spat collection, growth and meat yield of <i>Pinna bicolor</i> (Gmelin) in suspended culture in northern Australia A.C. Beer and P.C. Southgate (Townsville, QLD, Australia) . . . . .	424
Growth improvement by probiotic in European sea bass juveniles ( <i>Dicentrarchus labrax</i> , L.), with particular attention to IGF-1, myostatin and cortisol gene expression O. Carnevali, L. de Vivo, R. Sulpizio, G. Gioacchini, I. Olivotto (Ancona, Italy), S. Silvi and A. Cresci (Italy) . . . . .	430
Effects of the filter feeder silver carp and the bottom feeders mrigal and common carp on small indigenous fish species (SIS) and pond ecology A. Milstein (Israel), A.F. Ahmed, O.A. Masud, A. Kadir and M.A. Wahab (Mymensingh, Bangladesh) . . . . .	439
A new three-phase culture method for Manila clam, <i>Ruditapes philippinarum</i> , farming in northern China G. Zhang (Qingdao, PR China) and X. Yan (Qingdao, Beijing, Dalian, PR China) . . . . .	452
Effect of slaughter methods on blood spotting and residual blood in fillets of Atlantic salmon ( <i>Salmo salar</i> ) S.H. Olsen, N.K. Sorensen, S.K. Stormo and E.O. Elvevoll (Tromsø, Norway) . . . . .	462

**Nutrition**

Cross effects of the strain of dietary <i>Saccharomyces cerevisiae</i> and rearing conditions on the onset of intestinal microbiota and digestive enzymes in rainbow trout, <i>Onchorhynchus mykiss</i> , fry Y. Waché, F. Auffray, F.-J. Gatesoupe, J. Zambonino (Plouzané, France), V. Gayet, L. Labbé (Sizun, France) and C. Quentel (Plouzané, France) . . . . .	470
Effect of the incorporation level of herring meal into test diet on apparent digestibility coefficients for protein and energy by juvenile haddock, <i>Melanogrammus aeglefinus</i> L. J.-D. Kim (Chuncheon, Korea), S.M. Tibbetts, J.E. Milley and S.P. Lall (Nova Scotia Canada) . . . . .	479
Comparison of red chilli ( <i>Capsicum annuum</i> ) oleoresin and astaxanthin on rainbow trout ( <i>Oncorhynchus mykiss</i> ) fillet pigmentation G. Ingle de la Mora (C.P., México), J.L. Arredondo-Figueroa (Iztapalapa, México), J.T. Ponce-Palafox (Morelos, México), I.d.A. Barriga-Soca and J.E. Vernon-Carter (Iztapalapa, México) . . . . .	487
Feeding Saithe fillet or a formulated moist feed to the Brown crab <i>Cancer pagurus</i> : Effects on yield, composition and sensory quality of medium filled captured crabs G.M. Berge (Ås, Norway) and A. Woll (Ålesund, Norway) . . . . .	496
Effects of replacing fish meal with soy protein concentrate on feed intake and growth of juvenile Japanese flounder, <i>Paralichthys olivaceus</i> J. Deng, K. Mai, Q. Ai, W. Zhang, X. Wang, W. Xu and Z. Liufu (Qingdao, PR China) . . . . .	503
Effects of photoperiod and feeding frequency on performance of newly weaned Australian snapper <i>Pagrus auratus</i> B.J. Tucker (Sydney, Australia), M.A. Booth, G.L. Allan (Taylors Beach, NSW, Australia), D. Booth (Sydney, Australia) and D.S. Fielder (Taylors Beach, NSW, Australia) . . . . .	514
Effect of choline and methionine as methyl group donors on juvenile kuruma shrimp, <i>Marsupenaeus japonicus</i> Bate F.R. Michael (Kagoshima, Japan; Alexandria, Egypt), S. Koshio, S.-i. Teshima, M. Ishikawa and O. Uyan (Kagoshima, Japan) . . . . .	521
Induction of population growth, mictic female production and body size by treatment of a synthetic GnRH analogue in the freshwater rotifer, <i>Brachionus calyciflorus</i> Pallas V. Sugumar and N. Munuswamy (Chennai, India) . . . . .	529
Dietary lysine requirement of juvenile Japanese seabass, <i>Lateolabrax japonicus</i> K. Mai, Lu Zhang, Q. Ai, Q. Duan, C. Zhang, H. Li, J. Wan and Z. Liufu (Qingdao, PR China) . . . . .	535
Effects of seawater potassium concentration on the dietary potassium requirement of <i>Litopenaeus vannamei</i> C.-B. Zhu (Qingdao, Guangzhou, China), S.-L. Dong, F. Wang (Qingdao, China) and H.-H. Zhang (Guangzhou, China) . . . . .	543
Optimal dietary methionine requirement for Juvenile Cobia ( <i>Rachycentron canadum</i> ) Q.-C. Zhou, Z.-H. Wu (Zhanjiang, People's Republic of China), B.-P. Tan (Qingdao, People's Republic of China), S.-Y. Chi and Q.-H. Yang (Zhanjiang, People's Republic of China) . . . . .	551
Lutein does not influence flesh astaxanthin pigmentation in the Atlantic salmon ( <i>Salmo salar</i> L.) R.E. Olsen (Matredal, Norway) and R.T.M. Baker (Limburgerhof, Germany) . . . . .	558

**Physiology and Endocrinology**

Whole-body cortisol is an indicator of crowding stress in adult zebrafish, <i>Danio rerio</i> J.M. Ramsay, G.W. Feist (Corvallis, OR, USA), Z.M. Varga, M. Westerfield (Eugene, OR, USA), M.L. Kent and C.B. Schreck (Corvallis, OR, USA) . . . . .	565
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----



## Contents (continued)

Effect of salinity on reproduction and survival of the copepod <i>Pseudodiaptomus annandalei</i> Sewell, 1919 Q. Chen, J. Sheng, Q. Lin, Y. Gao and J. Lv (Guangzhou, People's Republic of China) . . . . .	575
Physiological effects of crowding in rainbow trout, <i>Oncorhynchus mykiss</i> , selected for low and high stress responsiveness C.E. Trenzado, A.E. Morales and M. de la Higuera (Granada, Spain). . . . .	583
Comparison of growth, osmoregulatory capacity, ionic regulation and organosomatic indices of black tiger prawn ( <i>Penaeus monodon</i> Fabricius, 1798) juveniles reared in potassium fortified inland saline water and ocean water at different salinities U. Tantulo and R. Fotedar (Bentley, Western Australia, Australia). . . . .	594
Thermal tolerance and metabolic activity of yellowtail catfish <i>Pangasius pangasius</i> (Hamilton) advanced fingerlings with emphasis on their culture potential D. Debnath, A.K. Pal, N.P. Sahu, K. Baruah, S. Yengkokpam, T. Das and S.M. Manush (Mumbai, India) . .	606
Pharmacological and immunocytochemical investigation of the role of catecholamines on larval metamorphosis by $\beta$ -adrenergic-like receptor in the bivalve <i>Meretrix meretrix</i> G. Wang (Qingdao, Beijing, PR China), B. Liu (Qingdao, PR China), B. Tang (Qingdao, Beijing, PR China), T. Zhang and J. Xiang (Qingdao, PR China). . . . .	611
Seasonal variations in chemical, physical, textural, and microstructural properties of adductor muscles of Pacific lions-paw scallop ( <i>Nodipecten subnodosus</i> ) A.I. Beltrán-Lugo, A.N. Maeda-Martínez (La Paz, Mexico), R. Pacheco-Aguilar (Sonora, México) and H.G. Nolasco-Soria (La Paz, Mexico) . . . . .	619
Metabolic and immune responses in Pacific whiteleg shrimp <i>Litopenaeus vannamei</i> exposed to a repeated handling stress L. Mercier, E. Palacios, Á.I. Campa-Córdova, D. Tovar-Ramírez, R. Hernández-Herrera and I.S. Racotta (Baja California Sur, México) . . . . .	633
<b>Technical Paper</b>	
Development of a multiplex PCR microsatellite assay in brown trout <i>Salmo trutta</i> , and its potential application for the genus E. Lerceteau-Köhler and S. Weiss (Graz, Austria) . . . . .	641
<b>Short Communications</b>	
Survival and water balance of black sea bass held in a range of salinities and calcium-enhanced environments after abrupt salinity change S.P. Young (Clemson, South Carolina, United States), T.I.J. Smith (Charleston, South Carolina, United States) and J.R. Tomasso (San Marcos, Texas, United States). . . . .	646
A simple device for sampling pond sediment T. Somsiri (Bangkok, Thailand), D.T.H. Oanh (Vietnam), S. Chinabut (Bangkok, Thailand), N.T. Phuong (Vietnam), M. Shariff, F.Md. Yusoff (Selangor, Malaysia), K. Bartie (Stirling, UK), M. Giacomini, M. Robba, S. Bertone (Genova, Italy), G. Huys (Gent, Belgium) and A. Teale (Stirling, UK) . . . . .	650
Effects of mussel farming on macrobenthic community structure in Southeastern Brazil K.G. da Costa and R.C. Nalesso (Vitória-ES, Brazil) . . . . .	655
Active substances from <i>Ceramium botryocarpum</i> used as antifouling products in aquaculture A. Bazes, A. Silkina, D. Defer (Lorient Cedex, France), C. Bernède-Bauduin (Paris, Cedex, France), E. Quémener (Lorient Cedex, France), J.-P. Braud (Bouin, France) and N. Bourgougnon (Lorient Cedex, France) . . . . .	664
Using hanging plastic trays for three-dimensional collection of antique mactra ( <i>Mactra antiquata</i> ) spat S. Chen, J. Wu, L. Chen and H. Zhang (Guangzhou, China) . . . . .	675
Protein sparing effect of carbohydrates in the diet of <i>Cirrhinus mrigala</i> (Hamilton, 1822) fry R.K. Singh, A.K. Balange and M.M. Ghughuskar (Mumbai, India) . . . . .	680
Extensive screening of sturgeon genomes by random screening techniques revealed no sex-specific marker S. Wuertz (Berlin, Germany), S. Gaillard (La Garde, France), F. Barbisan (Padova, Italy), S. Carle (La Seyne/ Mer, France), L. Congiu (Padova, Italy), A. Forlani (Ferrara, Italy), J. Aubert (La Garde, France), F. Kirschbaum (Berlin, Germany), E. Tosi (Ferrara, Italy), L. Zane (Padova, Italy) and J.-P. Grillasca (La Garde, France) . . . . .	685
<b>Contents of Aquaculture, Volume 258</b> . . . . .	689

